REMARKS

Claims 1-11 are all the claims pending in the application. By this Amendment, Applicant editorially amends claim 1. The amendment to claim 1 was made for reasons of precision of language and consistency, and does not narrow the literal scope of the claims and thus does not implicate an estoppel in the application of the doctrine of equivalents. The amendment to claim 1 was not made for reasons of patentability. Accordingly, entry of this amendment is respectfully requested.

I. Preliminary Matters

Applicant thanks the Examiner for returning the initialed form PTO/SB/08 filed with the Information Disclosure Statement on March 10, 2005.

Applicant respectfully requests the Examiner to indicate acceptance of the drawings filed on November 13, 2003.

II. Summary of the Office Action

The Examiner withdrew the previous rejections. The Examiner, however, found new grounds for rejecting the claims. Claims 1-11 stand rejected under 35 U.S.C. § 103(a).

III. Prior Art Rejections

Claims 1-9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,713,888 to Kajiura (hereinafter "Kajiura") in view of U.S. Patent No. 4,803,376 to N'Guyen (hereinafter "N'Guyen") and JP 2001-016900 to Uchiyama (hereinafter "Uchiyama"). Applicant respectfully traverses the rejection in view of the following comments.

Of the rejected claims, only claim 1 is independent. Independent claim 1 recites a number of unique features including:

> when said rotary machine is operated as the motor, said control device controls said electrical power converter so as to restrict the armature current at the time of low speed rotation,
>
> wherein the control device sets the armature current for starting torque to a smaller value to an extent of the field magnetic flux increased by the permanent magnets when said rotary machine is operated as the motor.

The Examiner acknowledges that Kajiura and N'Guyen fail to teach or suggest the control device set forth in claim 1. Yet, the Examiner alleges that Uchiyama cures the deficient teachings of Kajiura and N'Guyen (*see* page 3 of the Office Action). Applicant has carefully studied the combined teachings of Kajiura, N'Guyen, and Uchiyama and Applicant respectfully submits that Kajiura, N'Guyen, and Uchiyama, taken alone or in any conceivable combination, fail to teach or suggest at least the control device as set forth in claim 1.

By way of an example, in the exemplary, non-limiting embodiment of the present invention, a generator motor is a synchronous rotary machine composed of three phase armature windings and a field winding. In addition, the generator motor has permanent magnets for additional magnetic flux. The permanent magnets are inserted between each of adjacent claw-shaped pole pieces of the rotor cores and are magnetized to the same polarity of a respective claw-shaped pole to which it opposes. Accordingly, by disposing the permanent magnets between adjacent claw-shaped pole pieces of the rotor cores, the leakage flux between these claw-shaped poles is restrained and the magnetic flux from the permanent magnets is inter-linked with the armature winding together with the flux from the field winding.

The generator motor serves as both a starting motor at the starting stage of the vehicle and as a charging generator after the starting of the engine. The converter serves to convert the generator motor from starter motor to the charging generator and vice versa. The converter is a three phase full wave bridge circuit composed of switching elements and diodes. Both are controlled by the control device. The machine is full wave rectified by diodes when the machine performs as a generator and when the machine is operated as a motor, the converter serves as an inverter. The control device sets the armature current for the starting torque to a smaller value to the extent of the field magnetic flux increased by the permanent magnets when the rotary machine is operated as a motor. Accordingly, when the machine is operated as a motor, because of the increase in the magnetic flux inter-linked with the armature winding, the control device controls the converter so as to restrict the armature current at the time of low speed rotation.

It will be appreciated that the foregoing remarks relate to the invention in a general sense, the remarks are not necessarily limitative of any claims and are intended only to help the Examiner better understand the distinguishing aspects of the claims mentioned further above.

Turning to the prior art references cited by the Examiner, Kajiura relates to a synchronous machine for use in a vehicle motor-generator apparatus that is controllable for selectively performing electric motor and electric power generation functions (*see* Abstract). Kajiura discloses a combination permanent magnet and field winding synchronous machine that maintains a high degree of suppression of the adverse effects of magnetic flux during operation at a high speed of rotation, while the levels of generated torque and output power are increased in relation to the size of the machine (col. 3, lines 5 to 15).

Specifically, Kajiura discloses a synchronous machine 100 with a rotor 110 disposed within the inner periphery of the stator 120 with three-phase armature winding 121. The rotor 110 has a first rotor core 112 with field winding 111 and a second rotor core 114 mounted coaxially with the first rotor core 112. The second rotor core 114 has permanent magnets 2113 mounted thereon (Fig. 1; col. 8, lines 30 to 51). In Kajiura, an AC-to-DC and DC-to-AC power converter 200 is provided, which converts the DC voltage of a battery of the vehicle to an AC voltage, to thereby supply an AC armature current to an armature winding 121 of the synchronous machine when the machine is operated as a motor, and which receives the AC power from the armature winding 121 when the machine is operated as a generator (Fig. 1; col. 8, lines 52 to 67). A field current supply circuit 300 supplies a field current to the field winding of the synchronous machine, to produce a field winding magnetic flux, and a control circuit 400 controls the AC-to-DC and DC-to-AC power converter 200 and the field winding circuit, where while the synchronous machine is being operated as an electric motor to perform starting of the engine of the vehicle, the AC-to-DC and DC-to-AC power converter supplies to the armature winding the armature current as a current having a component which forms a magnetic flux in the same direction as that of the field winding magnetic flux (col. 9, lines 1 to 20).

N'Guyen discloses a control method that relates to an electrical machine capable of working either as a generator (alternator) or as a motor intended for a motor vehicle (*see* Abstract and col. 1, lines 26 to 43). N'Guyen discloses a machine having an inductor winding 1 controlled by a regulator 2 which controls the excitation current passing through the inductor 1, in such a way that a desired voltage is delivered at the output of the bridge 3 of rectifying diodes connected to the armature 4 having three phases in a star connection (Fig. 3; col. 3, lines 50 to

59). N'Guyen further discloses control means having current sensors and an electronic control module which controls the armature and inductor currents to obtain the desired characteristics (col. 13, lines 6 to 10). The control module 9 receives data on the angular position of the rotor from sensors H1, H2, and H3 and controls the contact breakers Q1...Q6 (col. 4, lines 28 to 38). Specifically, N'Guyen discloses that characteristics of the electrical machine in the motor mode depend on the operating characteristics in the alternator mode (col. 4, lines 51 to 55).

In N'Guyen, the armature is regulated so as to limit the current strength circulating in this armature to a predetermined value for speeds of rotation ranging from zero speed to a limit speed (col. 8, line 57 to col. 9, line 27). N'Guyen, however, fails to disclose or suggest restricting the armature current to a smaller value to the extent of the field magnetic flux increased by the permanent magnets. In fact, in N'Guyen, there are no permanent magnets.

As acknowledged by the Examiner, both Kajiura and N'Guyen do not disclose or suggest the control device controlling the electrical power converter to restrict the armature current to a smaller value to the extent of the field magnetic flux increased by the permanent magnets at the time of the low speed rotation (*see* page 3 of the Office Action). The Examiner contends that Uchiyama cures the deficient disclosure of Kajiura and N'Guyen. Applicant respectfully disagrees.

Uchiyama discloses a starter generator which can easily and effectively realize motor characteristics by a variable field system at a low cost. In particular, in Uchiyama, when the generator operates as a motor, it is supplied with power from the power supply 3 in a direction such of increasing the effective amount of magnetic flux to the field coil 2, and when it is started up, a large current flow is caused to flow also into the field coil 2 and therefore the generator

works as a low rotating speed and high torque type motor. As the rotating speed increases, the current flow into the armature coil 1 decreases, and a current flow into the field coil 2 also decreases together with the decrease in the current flow into the armature coil 1, automatically shifting the generator to a high rotating speed and low torque type motor (*see* Abstract and ¶ 30 of the machine translation).

In particular, in Uchiyama, when the generator operates as a motor, a voltage regulator 4 increases the amount of effective magnetic flux from a power source 3 to a field coil 2. A high current flows to a field coil 2 at the time of the starting. The current which flows to a field coil 2 decreases as the current of an armature coil 1 decreases, and a motor property shifts to high rotation and a low torque mold automatically (¶ 22 of the machine translation). In other words, in Uchiyama, it is disclosed that the magnetic flux from the power source 3 to a field coil 2 increases at the time of low speed rotation and not that the field magnetic flux is increased by the permanent magnets at the time of low speed rotation. In addition, in Uchiyama, there is no disclosure or suggestion of restricting the armature current at the starting to the extent the field magnetic flux is increased.

In addition, Uchiyama discloses that to switch from low rotation to high rotation both the armature current in the armature coil 1 and the current in the field coil 2 are decreased suggesting that both the current to the field coil 2 and to the armature 1 are high at the time of low speed rotation. In short, Uchiyama only discloses increasing magnetic flux at the time of starting and fails to disclose or suggest a relationship between the armature current and the permanent magnets. In other words, Uchiyama does not disclose or suggest restricting armature current to the extend the field magnetic flux is increased by the permanent magnets at starting.

Therefore "the control device sets the armature current for the starting torque to a smaller value to an extent of the field magnetic flux increased by the permanent magnets when said rotary machine is operated as the motor," as set forth in claim 1 is not taught or suggested by the combined teachings of Kajiura, N'Guyen, and Uchiyama, which lack defining a relationship between the permanent magnets and the armature current such that the armature current is set to a smaller value to an extent of the field magnetic flux increased by the permanent magnets, at the time of low speed rotation when the rotary machine is operated as the motor. For at least this exemplary reason, claim 1 is patentable over the combined teachings of Kajiura, N'Guyen, and Uchiyama. Accordingly, Applicant respectfully requests the Examiner to withdraw this rejection of claim 1 and its dependent claims 2-9.

In addition, claim 7 recites: "wherein the armature current at the time of low speed rotation is limited to 300 amperes or below." The Examiner maintains that the feature of claim 7 is nothing more than a routine range and does not accord it patentable weight (*see* page 4 of the Office Action). MPEP § 2144.05 states:

> **A particular parameter must first be recognized as a result-effective variable,** i.e., a variable which achieves a recognized result, **before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.** *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore **the parameter optimized was not recognized in the art to be a result-effective variable.**). See also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the formation of an alloy), emphasis added.

Similar to the above noted case, neither Kajiura nor N'Guyen nor Uchiyama disclose that the armature may be restricted to 300 amperes or below. That is, neither Kajiura nor N'Guyen nor Uchiyama discloses that the armature current can be lowered to the extent of the increase of the magnetic flux of the permanent magnets. In other words, neither Kajiura nor N'Guyen nor Uchiyama disclose such a low value of 300 amperes for the starting torque. Since, the combined teachings of Kajiura, N'Guyen, and Uchiyama fail to disclose the restriction of the armature current during low speed rotation to the extent of the increased magnetic flux, the limit of 300 amperes or below is not a result-effective variable but rather a unique feature that should be accorded patentable weight. The Examiner has failed to meet the necessary burden in establishing that the limit of 300 amperes is a result-effective variable and Applicant's arguments stand unrebutted.

For at least this additional exemplary reason, Applicant respectfully submits that claim 7 is patentable over the combined teachings of Kajiura in view of N'Guyen and Uchiyama.

Claims 10 and 11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kajiura, N'Guyen and Uchiyama, and further in view of JP 11-136913 to Asao et al. (hereinafter "Asao"). Applicant has already demonstrated that the combined teachings of Kajiura, N'Guyen, and do not teach or suggest the unique features of claim 1. Asao is being cited only for its teachings of claw-shaped pole pieces and as such clearly fails to cure the deficient teachings of Kajiura in view of N'Guyen (see page 4 of the Office Action). Therefore, at least by virtue of their dependency on claim 1, claims 10 and 11 are patentable over the combined teaching of Kajiura, N'Guyen, and Asao. Accordingly, Applicant respectfully requests the Examiner to withdraw this rejection of claims 10 and 11.

IV. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly invited to contact the undersigned attorney at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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Date: December 5, 2006

Attorney Docket No.: Q78397